STH265N6F6-2AG, STH265N6F6-6AG

Automotive N-channel 60 V, 1.6 mΩ typ., 180 A STripFET™ F6 Power MOSFET in H²PAK-2 and H²PAK-6 packages

Datasheet - production data

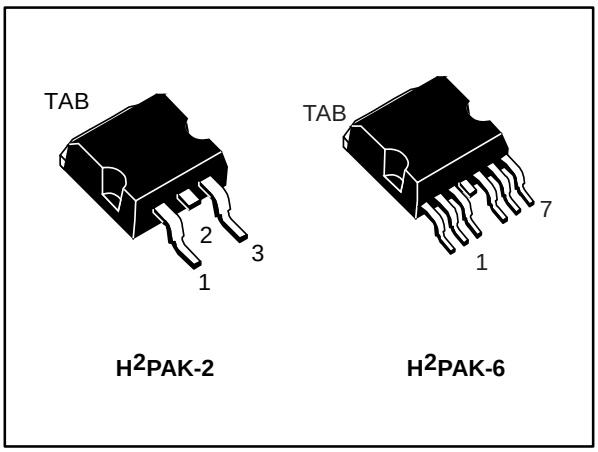
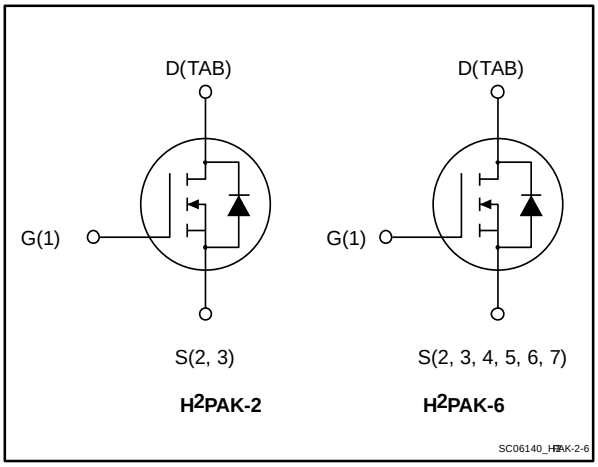


Figure 1: Internal schematic diagram



Features

Order code	V_{DS}	$R_{DS(on)}$ max	I_D
STH265N6F6-2AG	60 V	2.1 mΩ	180 A
STH265N6F6-6AG	60 V	2.1 mΩ	180 A

- Designed for automotive applications
- Very low on-resistance
- Very low gate charge
- High avalanche ruggedness
- Low gate drive power loss

Applications

- Switching applications

Description

This device is an N-channel Power MOSFET developed using the STripFET™ F6 technology with a new trench gate structure. The resulting Power MOSFET exhibits very low $R_{DS(on)}$ in all packages.

Table 1: Device summary

Order code	Marking	Package	Packaging
STH265N6F6-2AG	265N6F6	H²PAK-2	Tape and reel
STH265N6F6-6AG	265N6F6	H²PAK-6	Tape and reel

Contents

1 Electrical ratings

Table 2: Absolute maximum ratings

Symbol	Parameter	Value	Unit
V_{DS}	Drain-source voltage	60	V
V_{GS}	Gate-source voltage	± 20	V
I_D (1)	Drain current (continuous) at T_C = 25 °C	180	A
I_D (1)	Drain current (continuous) at T_C = 100 °C	180	A
I_{DM} (2)	Drain current (pulsed)	720	A
P_{TOT}	Total dissipation at T_C = 25 °C	300	W
E_{AS}	Single pulse avalanche energy (Starting T_J = 25 °C, I_D = 80 A)	720	mJ
	Derating factor	2	W/°C
T_{stg}	Storage temperature	- 55 to 175	°C
T_j	Operating junction temperature		

Notes:

(1)Current limited by package.

(2) Pulse width limited by safe operating area.

Table 3: Thermal data

Symbol	Parameter	Value	Unit
$R_{thj\text{-}case}$	Thermal resistance junction-case max	0.5	°C/W
$R_{thj\text{-}pcb}$ (1)	Thermal resistance junction-pcb max	35	°C/W

Notes:

(1)When mounted on FR-4 board of 1 inch², 2 oz Cu.

2 Electrical characteristics

(T_{CASE} = 25 °C unless otherwise specified)

Table 4: On/off states

Symbol	Parameter	Test conditions	Min.	Typ.	Max.	Unit
$V_{(BR)DSS}$	Drain-source breakdown voltage (V_{GS} = 0)	I_D = 250 µA	60			V
I_{DSS}	Zero gate voltage drain current (V_{GS} = 0)	V_{DS} = 60 V			1	µA
		V_{DS} = 60 V, T_C=125 °C			100	µA
I_{GSS}	Gate-body leakage current (V_{DS} = 0)	V_{GS} = ± 20 V			± 100	nA
$V_{GS(th)}$	Gate threshold voltage	V_{DS} = V_{GS}, I_D = 250 µA	2		4	V
$R_{DS(on)}$	Static drain-source on-resistance	V_{GS} = 10 V, I_D = 60 A		1.6	2.1	mΩ

Table 5: Dynamic

Symbol	Parameter	Test conditions	Min.	Typ.	Max.	Unit
C_{iss}	Input capacitance	V_{DS} = 25 V, f = 1 MHz, V_{GS} = 0	-	11800	-	pF
C_{oss}	Output capacitance		-	1235	-	pF
C_{rss}	Reverse transfer capacitance		-	488	-	pF
Q_g	Total gate charge	V_{DD} = 30 V, I_D = 120 A, V_{GS} = 10 V	-	183	-	nC
Q_{gs}	Gate-source charge		-	53	-	nC
Q_{gd}	Gate-drain charge		-	41	-	nC

Table 6: Switching times

Symbol	Parameter	Test conditions	Min.	Typ.	Max.	Unit
$t_{d(on)}$	Turn-on delay time	V_{DD} = 30 V, I_D = 60 A R_G = 4.7 Ω, V_{GS} = 10 V	-	31	-	ns
t_r	Rise time		-	165	-	ns
$t_{d(off)}$	Turn-off-delay time		-	144	-	ns
t_f	Fall time		-	63	-	ns

Table 7: Source drain diode

Symbol	Parameter	Test conditions	Min.	Typ.	Max.	Unit
I_{SD}	Source-drain current				180	A
I_{SDM} (1)	Source-drain current (pulsed)				720	A
V_{SD} (2)	Forward on voltage	I_{SD} = 180 A, V_{GS} = 0			1.1	V
t_{rr}	Reverse recovery time	I_{SD} = 120 A, V_{DD} = 48 V di/dt = 100 A/µs, T_j = 150 °C	-	56	-	ns
Q_{rr}	Reverse recovery charge		-	116	-	nC
I_{RRM}	Reverse recovery current		-	3.8	-	A

Notes:

(1) Pulse width limited by safe operating area.

(2)Pulsed: pulse duration = 300 µs, duty cycle 1.5%

2.2 Electrical characteristics (curves)

Figure 2: Safe operating area

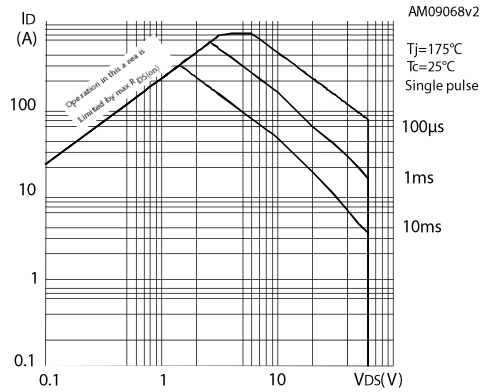


Figure 3: Thermal impedance

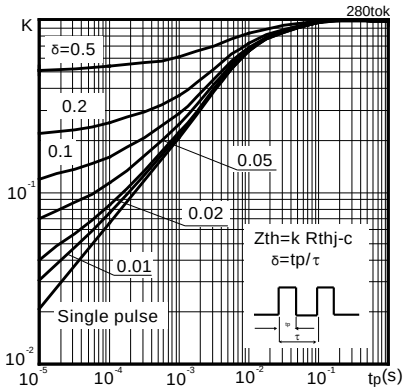


Figure 4: Output characteristics

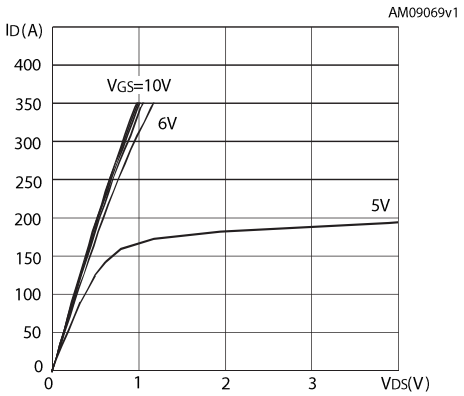


Figure 5: Transfer characteristics

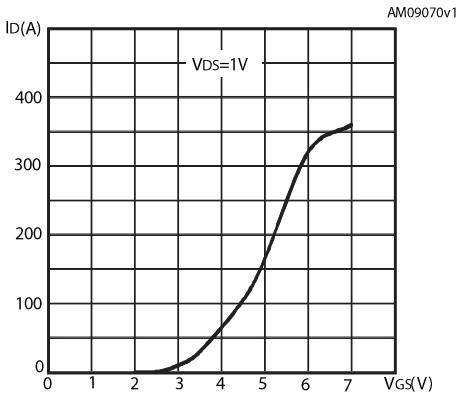


Figure 6: Normalized V(BR)DSS vs. temperature

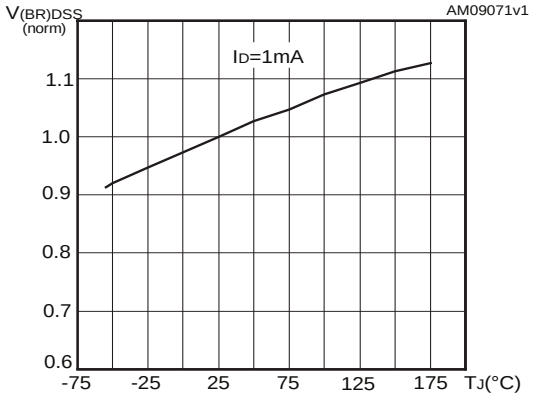


Figure 7: Static drain-source on resistance

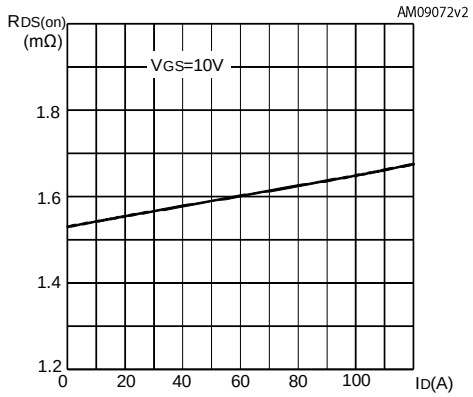


Figure 8: Gate charge vs. gate-source voltage

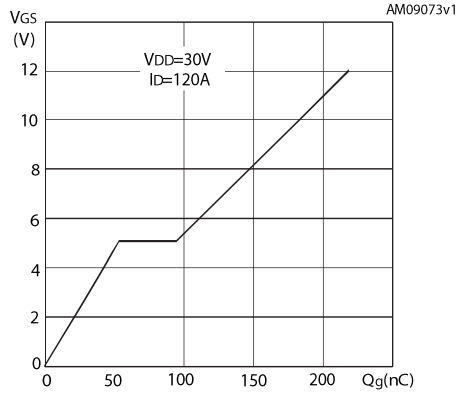


Figure 9: Capacitance variations

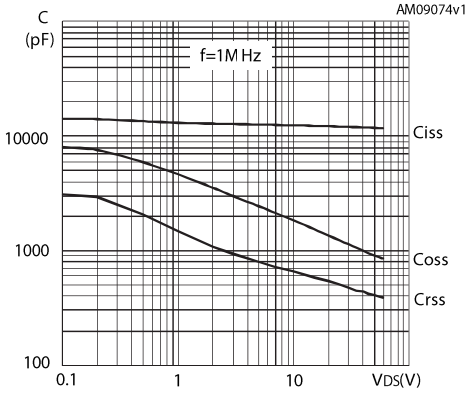


Figure 10: Normalized gate threshold voltage vs. temperature

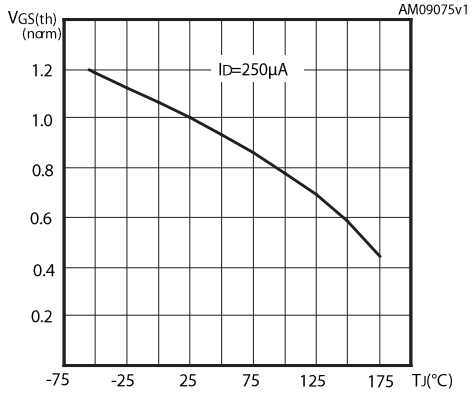


Figure 11: Normalized on resistance vs. temperature

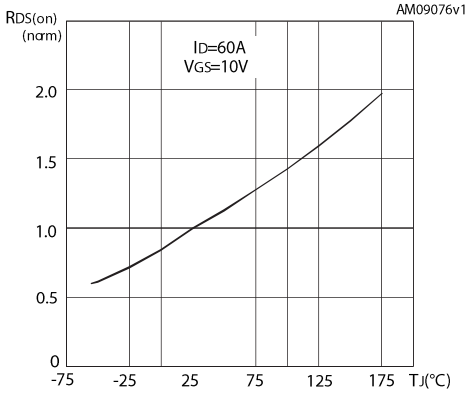
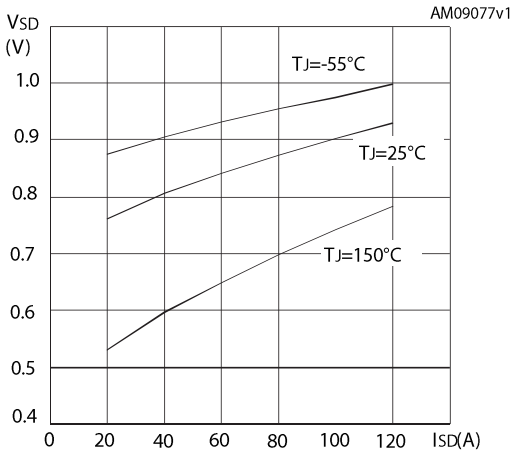


Figure 12: Source-drain diode forward characteristics



3 Package mechanical data

In order to meet environmental requirements, ST offers these devices in different grades of ECOPACK® packages, depending on their level of environmental compliance. ECOPACK® specifications, grade definitions and product status are available at: ***www.st.com***. ECOPACK® is an ST trademark.

3.1 H2PAK-2 mechanical data

Figure 13: H²PAK-2 outline

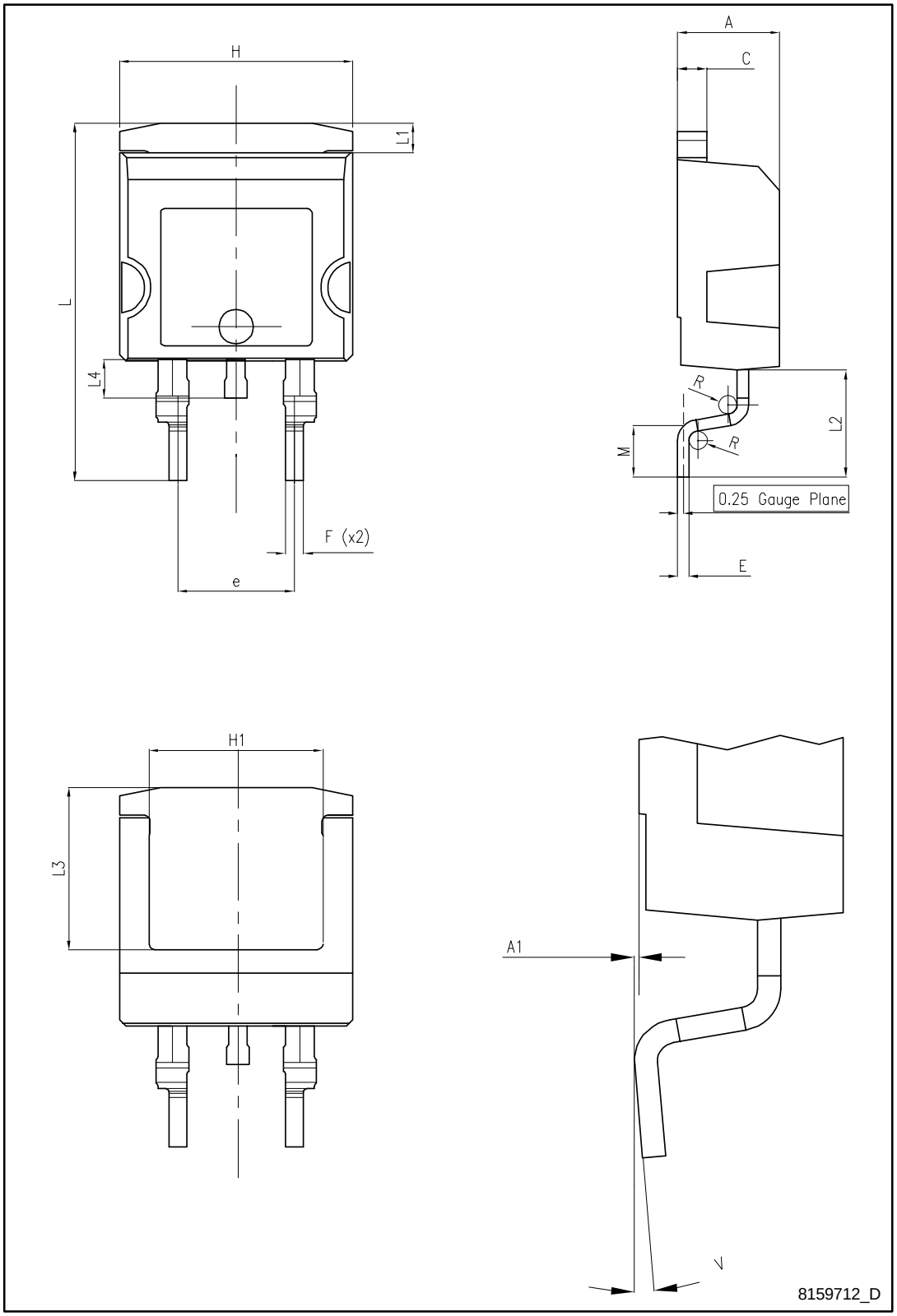
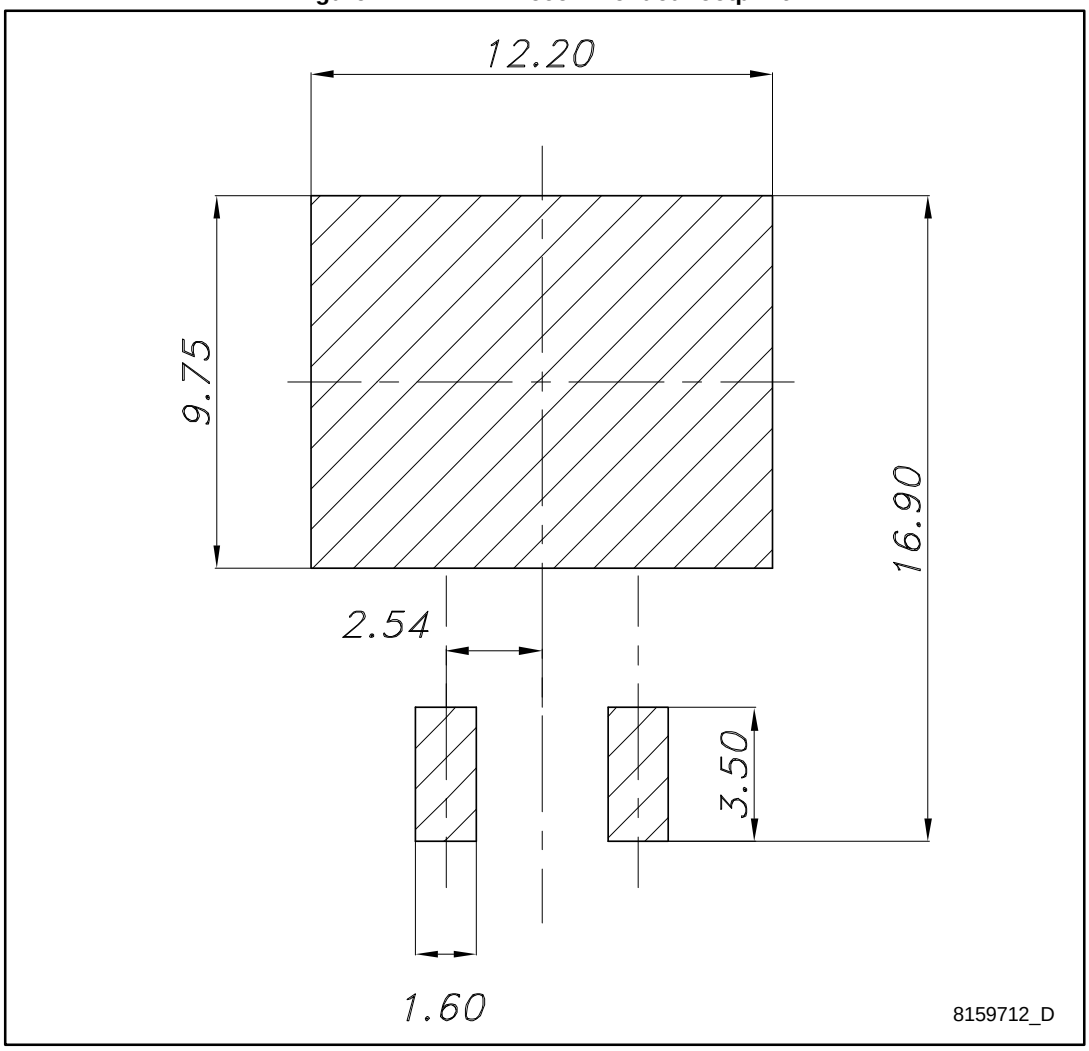


Table 8: H²PAK-2 mechanical data

Dim.	mm		
	Min.	Typ.	Max.
A	4.30	-	4.80
A1	0.03		0.20
C	1.17		1.37
e	4.98		5.18
E	0.50		0.90
F	0.78		0.85
H	10.00		10.40
H1	7.40		7.80
L	15.30		15.80
L1	1.27		1.40
L2	4.93		5.23
L3	6.85		7.25
L4	1.5		1.7
M	2.6		2.9
R	0.20		0.60
V	0°		8°

Figure 14: H²PAK-2 recommended footprint



3.2 H²PAK-6 package information

Figure 15: H²PAK-6 outline

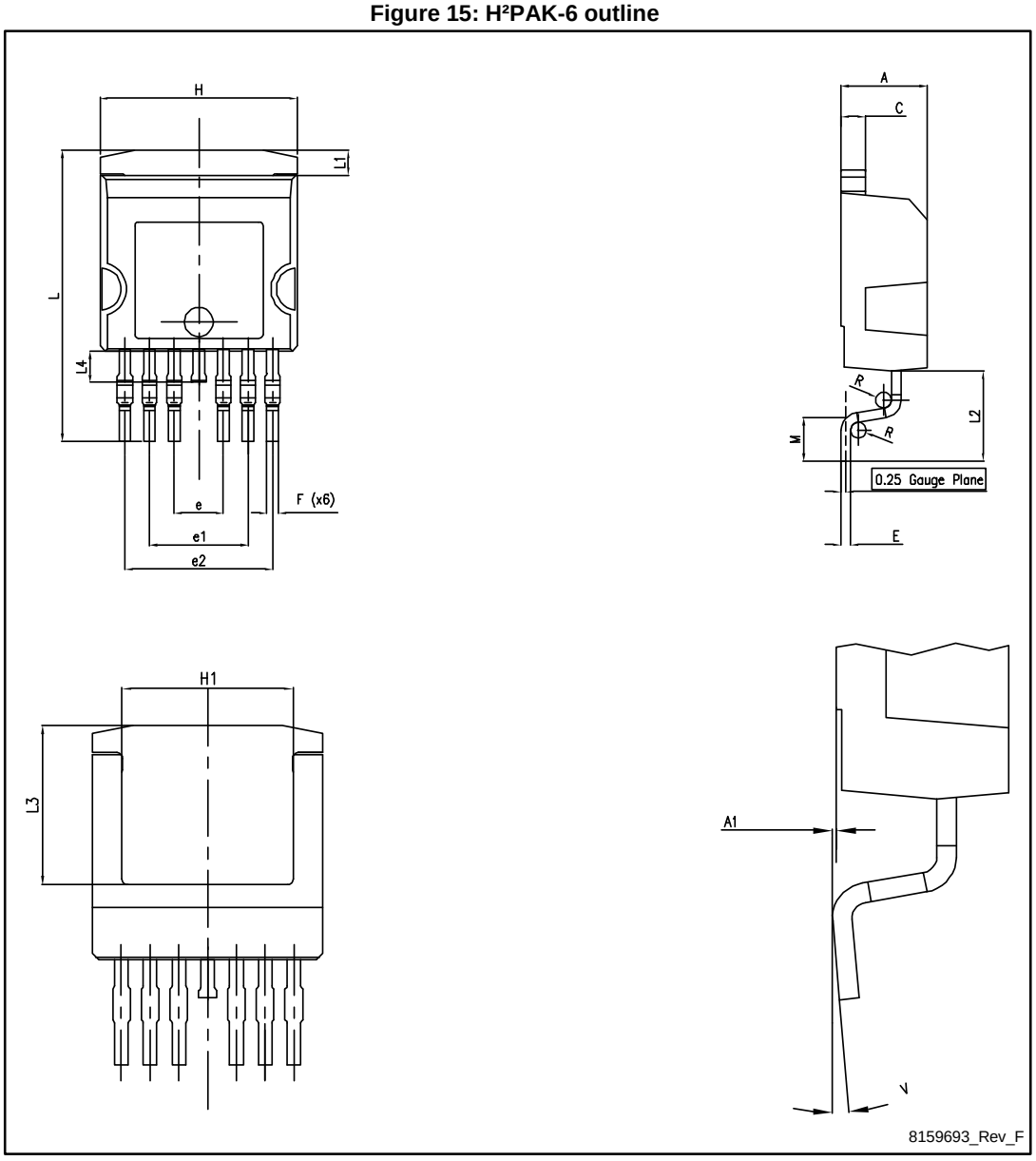
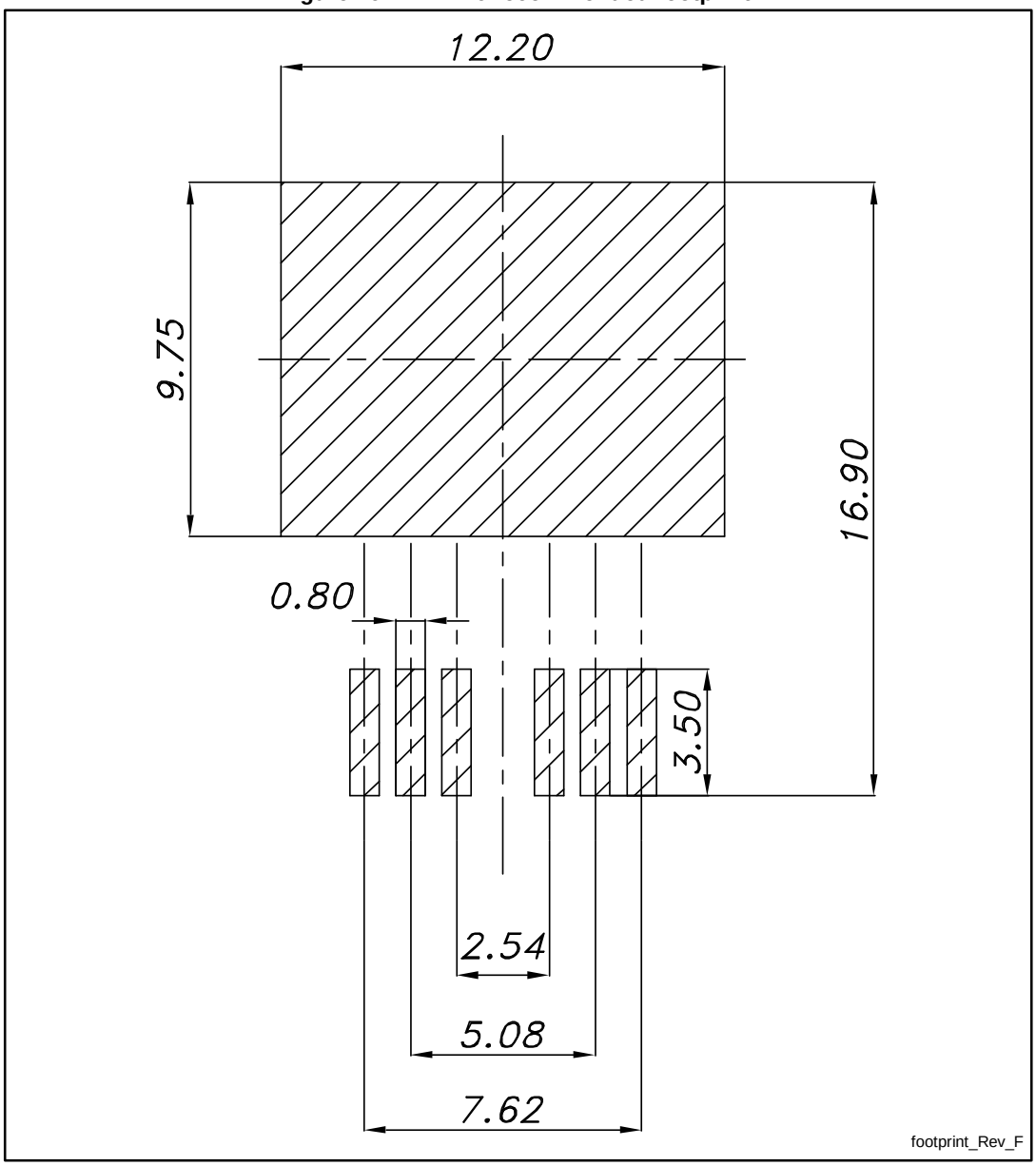


Table 9: H²PAK-6 mechanical data

Dim.	mm		
	Min.	Typ.	Max.
A	4.30	-	4.80
A1	0.03		0.20
C	1.17		1.37
e	2.34		2.74
e1	4.88		5.28
e2	7.42		7.82
E	0.45		0.60
F	0.50		0.70
H	10.00		10.40
H1	7.40		7.80
L	14.75		15.25
L1	1.27		1.40
L2	4.35		4.95
L3	6.85		7.25
L4	1.5		1.75
M	1.90		2.50
R	0.20		0.60
V	0°		8°

Figure 16: H²PAK-6 recommended footprint



Dimensions are in mm.

4 Packaging information

Figure 17: Tape outline

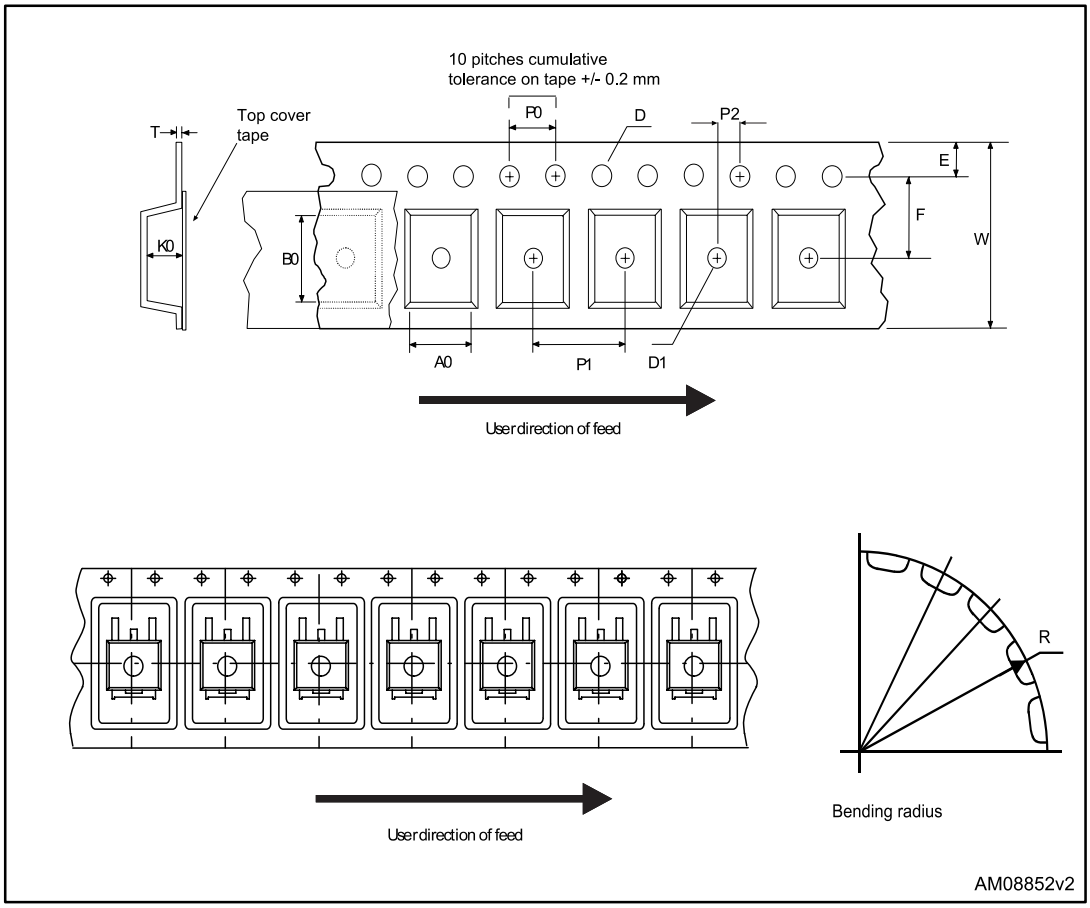


Figure 18: Reel outline

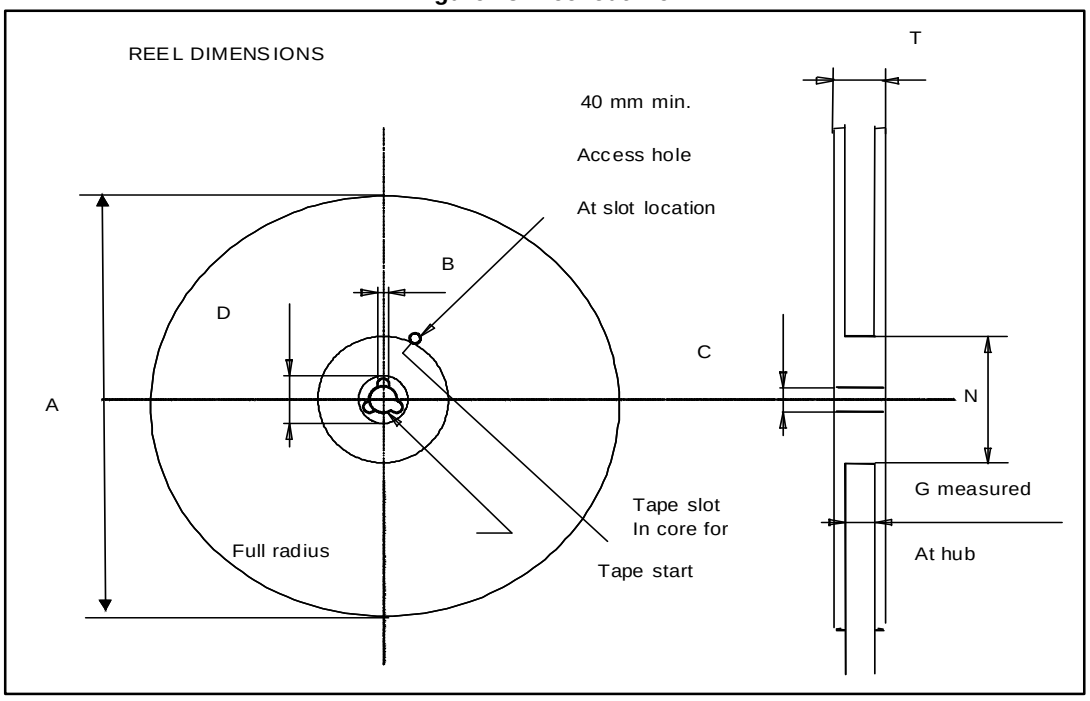


Table 10: Tape and reel mechanical data

Tape			Reel		
Dim.	mm		Dim.	mm	
	Min.	Max.		Min.	Max.
A0	10.5	10.7	A		330
B0	15.7	15.9	B	1.5	
D	1.5	1.6	C	12.8	13.2
D1	1.59	1.61	D	20.2	
E	1.65	1.85	G	24.4	26.4
F	11.4	11.6	N	100	
K0	4.8	5.0	T		30.4
P0	3.9	4.1			
P1	11.9	12.1	Base quantity		1000
P2	1.9	2.1	Bulk quantity		1000
R	50				
T	0.25	0.35			
W	23.7	24.3			

5 Revision history

Table 11: Document revision history

Date	Revision	Changes
13-Oct-2014	1	First release.
18-Dec-2014	2	Document status promoted from preliminary to production data.

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